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(33) Austria (OE)

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(19)

(54) METHOD FOR PRODUCING STACKED PACKS OF ZIG-ZAG INTER-FOLDED PAPER TISSUES AND DEVICE FOR IMPLEMENTATION OF THE METHOD

(71) We, BUNZEL & BIACH AKTIENGESELLSCHAFT, a joint stock company organised under the laws of Austria, of Engerthstrasse 161-163, Vienna II, Austria, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to the production of a stacked pack of zig-zag interfolded paper tissues, and provides a method for the production of a pack of tissues interfolded in zig-zag fashion which comprises continuously forming a two-layer web of unfolded tissues and advancing it longitudinally through a defile from which two carriers diverge in the direction of advance, superposed tissues of the said web being displaced one half tissue length relative to one another in the direction of advance, and folding the two-layer web about the central transverse lines of successive tissues to form the interfolded zig-zag stack by momentarily attaching the web by suction alternately at the central transverse line of a tissue of one layer to the directly adjacent carrier and at the central transverse line of the succeeding tissue of the other layer to the other carrier. The tissues may be cosmetic tissues from from tissue paper, fine crepe, fine fleece or the like, and the direction of the tissue fibre is usually transverse to the folding edges.

In a known process the two-layer web of tissue paper is folded into a zig-zag stack by means of two drums on which tongs are peripherally mounted, the middle of each tissue being pushed into a tong by a strip on the drum opposite to the one where the particular tissue is supported. This folding process requires high precision in the instrumental equipment and in the control of this equipment, and observance of close tolerances with the paper being treated; there is also the continual danger of the tissues being torn as the paper is gripped by the tongs, whilst the operating speed is also greatly limited by the tongs.

In the process of the invention the middle of any tissue for folding is simply sucked momentarily onto the adjacent one of the carriers diverging from the defile. The tissues are preferably cut from the two webs before the defile on the same carriers. This mode of operation makes it possible at relatively low cost to produce stacked packs of the kind in question at great operating speed, and with little danger of tissues made from very light grades of paper, as at present used for cosmetic purposes, being damaged in the course of production of the stacked packs.

Provision can with advantage be made for not folding the last tissue of each stack; without additional expenditure one can thus most simply mark the stacks which are to be emboxed at any particular time, and by using this marking the individual zig-zag stacks can then be laid manually or by machine in the boxes provided for them.

The invention also provides apparatus for use in the above-defined method, this comprising two opposed co-operating drums mounted for rotation about parallel axes, each drum having suction ducts opening onto its peripheral face at ports arranged in rows which run along face-generators of the drum and which are spaced a uniform length apart in the peripheral direction, and the two drums being so coupled that in the course of rotation each said row of suction ports of one drum comes into opposition with the other drum midway between two said rows of suction ports on the other drum, and means for forming and feeding between the co-operating faces of the two drums a two-layer web of un-

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In a known process the two-layer web of tissue paper is folded into a zig-zag stack by means of two drums on which tongs are peripherally mounted, the middle of each tissue being pushed into a tong by a strip on the drum opposite to the one where the particular tissue is supported. This folding process requires high precision in the instrumental equipment and in the control of this equipment, and observance of close tolerances with the paper being treated; there is also the continual danger of the tissues being torn as the paper is gripped by the tongs, whilst the operating speed is also greatly limited by the tongs.

In the process of the invention the middle of any tissue for folding is simply sucked momentarily onto the adjacent one of the carriers diverging from the defile. The tissues are preferably cut from the two webs before the defile on the same carriers. This mode of operation makes it possible at relatively low cost to produce stacked packs of the kind in question at great operating speed, and with little danger of tissues made from very light grades of paper, as at present used for cosmetic purposes, being damaged in the course of production of the stacked packs.

Provision can with advantage be made for not folding the last tissue of each stack; without additional expenditure one can thus most simply mark the stacks which are to be emboxed at any particular time, and by using this marking the individual zig-zag stacks can then be laid manually or by machine in the boxes provided for them.

The invention also provides apparatus for use in the above-defined method, this comprising two opposed co-operating drums mounted for rotation about parallel axes, each drum having suction ducts opening onto its peripheral face at ports arranged in rows which run along face-generators of the drum and which are spaced a uniform length apart in the peripheral direction, and the two drums being so coupled that in the course of rotation each said row of suction ports of one drum comes into opposition with the other drum midway between two said rows of suction ports on the other drum, and means for forming and feeding between the co-operating faces of the two drums a two-layer web of un-

folded tissues in which each tissue is of said uniform length and in which superposed tissues are longitudinally displaced one-half tissue length relative to one another.

The suction openings of the drums may be slits in the peripheral direction. With suction openings of this kind, the paper webs and/or web sections, when sucked onto the drums, are able to shift slightly in the direction of travel and thus, for example, the webs or web sections can in a simple way be tensioned without the danger of tearing.

Each drum may have second suction ducts opening onto the face at second ports arranged in second rows which run along face-generators of the drum between the first-mentioned rows so that in the course of rotation a said second row of one drum meets a first-mentioned row of the other drum, means being provided for cutting off suction through the ports of the second row concerned during such meeting. Preferably, each said first-mentioned row of suction ports of each drum is at an inwardly sunken region of the drum face and each said second row of suction ports is at a less or non-sunken region of the face of the drum. From this can derive the advantage, inter alia, that one can reliably stop paper tissues or paper web sections, sucked onto the drum, being stripped off by stacks of tissues already formed at the folding station.

Provision can with advantage be made for placing blade-rolls for cutting the oncoming webs into single tissues before the defile between the drums. On the blade-rolls are mounted blades which interact with counterknives provided on the drums. Thus the drums are themselves the auxiliary carriers on which the shearing takes place and by which the tissues are supplied to the folding region. The counterknives on the drums can with advantage be made in the form of blade strips, in which the second suction openings are preferably arranged so that the paper webs are fixed exactly in the shearing area, such a design here unsuring moreover a reduction in the cost of producing the drums since it is much simpler to make the suction holes in strips to be set in the drum surface, than in the drum surface itself.

In order to achieve a high rate of production, attention has also to be paid to taking or laying off the tissues from the carriers or drums onto the folded stack. In order to speed up freeing of the tissues, compressed air can be blown between the carrier and the tissue either lying on or adhering to its surface, for instance, through the suction openings or through openings in the carriers themselves. But one can also, for instance, provide stationarily supported, reposable stripping attachments around the periphery of the drums. Such strippers can here be in the form of flaps which are seated on shafts and perform an oscillatory motion which is synchronised with the rotation of the drums.

In the following paragraphs the invention will now be further described, by way of example, with reference to the embodiments schematically represented in the drawings.

In the drawings, Fig. 1 shows a perspective view of a stacked pack producible by a method according to the invention, one wall having been omitted from the box surrounding the stack of tissues. Fig. 2 illustrates apparatus according to the invention. Fig. 3 shows part of the Fig. 2 apparatus on a larger scale. Fig. 4 shows another apparatus according to the invention.

In the stacked pack represented in Fig. 1, the box 1 has the front end-wall removed to show the stack of zig-zag interfolded paper tissues 2 which are made from fine tissue paper as extensively used at present for cosmetic purposes. The top cover 3 of the box 1 has a withdrawal opening 4 through which the paper tissues can be drawn one after the other from the stack 2 in the box. The interfolding in zig-zag fashion has the result that when one paper tissue 5 is drawn from time to time through the opening 4, the start of the next tissue in stack 2 is drawn through the opening too, hence a new tissue is placed ready for removal. In Fig. 1 only a few tissues 5 are shown so as to illustrate the zig-zag folding more clearly; in practice such a stack in the fully filled condition consists of about 100 to 200 interfolded tissues. The single tissues 5 of stack 2 are inter-laid independently of one another. In tissues 5 the fibres run primarily in the direction of the double arrow 7, i.e. in that direction in which the tissues are drawn in withdrawal through the opening 4, and therefore transverse to the fold edges 6 of the tissues 5 and also transverse to the longitudinal extent of the opening 4. Since in this way the tissues 5 are stressed in the direction of their greatest strength on withdrawal through the opening, the danger of tearing the tissues 5 on withdrawal is reduced in practice even when the stacked pack is fully filled and the tissues 5 closely press on one another in the box. Furthermore, the tissues 5 being inter-laid in zig-zag fashion independently of one another ensures that whenever a tissue is withdrawn from the opening 4 only the start of one tissue next in the stack is drawn through the opening 4.

In the machine illustrated in Fig. 2 the

two delivery spools 10 and 11 which are driven by the peripheral drives 12, pay out two webs of paper 13 and 14 continuously. The two webs 13 and 14 then come to one or several serially arranged longitudinal shears 15 which cut the oncoming webs 13 and 14 longitudinally to a width or widths corresponding to the desired width of the paper tissues. Cut in this way into tissue widths, the webs 13a and 14a separate and pass across guide rolls to the forward-draw rolls 16, whence they are fed to the transverse shears. These transverse shears are in the form of blade rolls 17 which co-operate with the periphery of the drums 18. These drums 18 thus deliver the individual sections cut from the webs 13a and 14a by the blade rolls 17, into the folding region, and also in the folding region they perform the folding of these web sections or tissues into a zig-zag stack 2.

The conversion of the webs 13 and 14 into single tissues in the course of producing the stack of zig-zag folded tissues can alternatively be so conducted that the cross-cut and the subsequent folding are carried out firstly, and the zig-zag stack so arising, which at any particular time exhibits a width corresponding to that of the webs 13 and 14, is then cut to the desired width by strip-cutting shears or by a separate cutting machine, in which case the longitudinal shears 15 are of course no longer required.

Fig. 3 shows on a larger scale the rolls 17 and drums 18 of Fig. 2.

As shown in Fig. 3 the webs 13a and 14a are fed to the blade rolls 17, the blades 20 of which co-operate with counterknives which are provided on the drums 18. These counterknives are in the form of blade strips 21 each with a cutting edge 22. The blade strips 21 of each drum 18 have suction openings 23 arranged behind their cutting edges 22 in the direction of travel of the drum. These suction openings 23 are slits in the peripheral direction of the drums 18. Thus each of the strips 21 has a row of serially laid suction openings 23 so that peripherally spaced rows of suction openings run across the face of each drum axially of the drum. Each of the drums 18 here accommodates three blade strips 21, the mutual spacing of which, measured in the peripheral direction, corresponds to the prescribed length of the tissues to be cut from the webs 13a and 14a. Halfway between each adjacent pair of strips 21 there is a further row of suction openings 24 which likewise runs axially across the face of the drum. Thus around the periphery of each drum 18 rows of suction openings are arranged which in the peripheral direction exhibit a spacing which corresponds approximately to one-half of the length of one tissue.

The suction openings 23 and 24 are associated via communicating channels 25 with collecting ducts 26 which are connected in a known but schematically represented manner to the end faces of the drums at suction channels or pneumatic lines, the evacuation of ducts 26 or admission of compressed air being effected from time to time in a predetermined cycle. In the operation of the device shown in Fig. 3, the webs 13a and 14a are cut by the co-operation of the blades 20 of the blade rolls 17 with the cutting edges 22 of the strips 21, into single sections or tissues; owing to the suction openings 23 in the blade strips 21 at any particular time the start of the, as yet, non-divided part of the web 13a or 14a is held fast on the drum face and advanced further by the drum rotation. The slit-type design of the suction openings 23 makes possible a slight displacement of the start of the web in the peripheral direction, so that the web 13a or 14a can be held taut without difficulty. One can thus slightly vary the cut length of the individual tissues by varying to some extent the peripheral speed of the draw-forward rolls. In the course of further rotation of its drum 18 the web 13a or 14a comes to lie on the suction openings 24 following after the openings 23, and is held there by suction. The drums 18 deliver the tissues cut from the webs 13a and 14a into the folding region of the device which, in the example shown in Fig. 3, is to the right of the defile 27 between drums 18.

The relative angular position of the two drums 18 is so selected that in the defile 27 in the course of drum rotation one blade strip 21 of one drum and a row of suction openings 24 of the other drum meet one another. It will be seen from this that a two-layer web of superposed single tissues is supplied to the folding region so that the individual tissues are joined as closely as possible together and the superposed tissues of the two layers arising from the webs 13a and 14a are displaced in relation to one another in the direction of travel of the two-layer web by an amount which at any particular time is equal to one-half of the tissue length. This two-layer web in the folding region is subjected to alternate suction onto the two drums 18 which in the folding region act as auxiliary carriers, so folding the stack 2 which is laid off on the repository table 30.

In order to carry out the folding process, the suction on the front edge of the tissue, separated at the time from the web 13a or 14a, through the suction openings 23 of the associated blade strip 21 is shut off in passing the defile 27, so that the area of the front edge of this tissue or web section,

separated from the web 13a or 14a, is sucked to the corresponding suction opening 24 of the other drum 18 which at this point in time is opposite the said blade strip 21. With the tissue papers provided for processing here, there is thus suction also right through the tissue present on the other drum 18. One can, as already mentioned above, apply suction to the suction openings 24 before they reach the defile 27 in order to hold the paper more closely on the drum, or if this is not necessary the suction openings 24 can be connected to the vacuum system only on passing the defile 27. Thereupon, in the course of further rotation of that drum to whose suction openings 24 the two paper layers are sucked in the region of the defile 27, the paper tissue lying directly on the drum in question is provided with a folding edge 6 owing to its outward travel from the middle position and the indirectly sucked tissue is held in the region of this folding edge 6, as shown in Fig. 3. When this folding edge 6 reaches the stripper 31 associated with the drum 18 in question, the connection between the vacuum system and the suction ports 24 will be interrupted, and the part of the paper tissue lying in the region of the folding edge 6 is laid by the stripper 31 on the stack 2. The strippers 31 are arranged on fixed-support shafts 32 and are fitted with pins 33 which can engage in corresponding clearances 34 in the face of the drums 18. An oscillatory motion, synchronised with the rotation of the drums 18. is imparted to the shafts 32 by means of a drive which is not shown.

As soon as the folding edge 6 in the tissue lying directly at the suction ports 24 reaches the stripper 31, as shown in Fig. 3, the next blade strip 21 of this drum is also coming into the defile 27 and it is turned off from the suction line. As a result, the front edge of a tissue sucked hitherto at this blade strip becomes sucked through the tissue directly on the other drum 18 to the suction ports 24 thereon and then, as has been described in relation to the upper drum in Fig. 3, a folding edge is formed in the tissue on the lower drum, and thereupon the part of the particular tissue in the region of this folding edge is pressed by the stripper 31, associated with the lower drum, onto the stack 2.

This process is thereafter repeated alternately, a stack 2 of zig-zag interfolded paper tissues is formed, and the start and end of two tissues separated from web 13a or 14a come continually to lie at the folding edge of a tissue which was separated from the other web 14a or 13a respectively.

In order reliably to avoid an undesired stripping of the paper tissues from the drums in the folding region due to tissues already on stack 2, the face surface of the drums 18 is inwardly sunken in the region of the rowse of suction ports 24.

The number of tissues to be emboxed at any particular time is determinable during the folding process by a suitable counter associated with the drums 18, and in order, at any particular time, to characterise a stack envisaged for emboxment, one can, in this connection, after automatic counting of a definite number of folds, apply a characteristic by which the tissues counted in this way can then be introduced manually or automatically into the box provided. Such marking can be applied, for instance, by tearing or staining one tissue. But a mark can be made very simply by not folding the marker tissue. In the device illustrated in Fig. 3, this can be arranged, for instance, by the suction ports 24 remaining in communication with the evacuation line after reaching the region of the stripper 31, and then in this time span the stripper 31 is held in its extreme end position.

In the device illustrated in Fig. 4 two webs 13a and 14a of the paper to be processed are supplied by the draw-forward rolls 16 and guides 34 to cross-shears 36 at the guide exit. After the cross-shears 36 which divide the webs 13a and 14a into single sections or tissues, there are two auxiliary carriers in the form of air-permeable conveyor belts which are so supported on suction tables 38 that the tissues coming from the cross-shears 36 are held on the conveyors 37 and then fed by the conveyors to a common guide 39. Under the guide 39, where the folding region begins, there are two drum-like auxiliary carriers 40 which are mounted on shafts 42, and are provided with suction ports 41 at their faces. By means of a drive (not represented), the drums 40 are rotated at a speed synchronised to the intake of single tissues through the guide 39, and in synchronism with this motion the suction ports 41 are superposed into and out of communication with a suction line so that superposed tissues are sucked alternately to one drum and then to the other to form a stack 2 of zig-zag interfolded tissues in successive folding operations as shown.

WHAT WE CLAIM IS:—

1. A method for the production of a pack of tissues interfolded in zig-zag fashion which comprises continuously forming a two-layer web of unfolded tissues and advancing it longitudinally through a defile from which two carriers diverge in the direction of advance, superposed tissues of the said web being displaced one half tissue length relative to one another in the direction of advance, and folding the two-layer web about the central transverse

lines of successive tissues to form the interfolded zig-zag stack by momentarily attaching the web by suction alternately at the central transverse line of a tissue of one layer to the directly adjacent carrier and at the central transverse line of the succeeding tissue of the other layer to the other carrier.

2. A method according to claim 1 wherein the tissues for forming the two-layer web are cut from two separate webs lying respectively on the same said carriers before passing the defile.

3. A method according to claim 1 or 2 wherein the last tissue of the pack is not folded.

4. Apparatus for use in a method according to claim 1 comprising two opposed co-operating drums mounted for rotation about parallel axes, each drum having suction ducts opening onto its peripheral face at ports arranged in rows which run along face-generators of the drum and which are spaced a uniform length apart in the peripheral direction, and the two drums being so coupled that in the course of rotation each said row of suction ports of one drum comes into opposition with the other drum midway between two said rows of suction ports on the other drum, and means for forming and feeding between the co-operating faces of the two drums a two-layer web of unfolded tissues in which each tissue is of said uniform length and in which superposed tissues are longitudinally displaced one-half tissue length relative to one another.

5. Apparatus according to claim 4 wherein before the defile between the drums are respective blade rolls for cutting respective oncoming webs into the single unfolded tissues of the two-layer web, these blade rolls carrying blades which co-operate with counterknives provided on the drums.

6. Apparatus according to claim 4 or 5 wherein each drum has further second suction ducts opening onto the face at second ports arranged in second rows which run along face-generators of the drum between the first mentioned rows so that in the course of rotation a said second row of one drum meets a first mentioned row of the other drum, means being provided for cutting off suction throug the ports of the second row concerned during such meeting.

7. Apparatus according to claim 6 wherein the counterknives on the drums are in the form of blade strips in which said second suction ports are arranged.

8. Apparatus according to claim 6 or 7 wherein each said first-mentioned row of suction ports of each drum is at an inwardly sunken region of the drum face and each said second row of suction ports is at a less or non-sunken region of the face of the drum.

9. Apparatus according to any of claims 4 to 8 wherein the suction ports of the suction drums are in the form of slits in the peripheral direction.

10. A method of producing a pack of tissues substantially as hereinbefore described with reference to Figs. 2 and 3 of the accompanying drawings.

11. A method of producing a pack of tissues substantially as hereinbefore described with reference to Fig. 4 of the accompanying drawings.

12. Apparatus for producing a pack of tissues substantially as hereinbefore described with reference to Figs. 2 and 3 of the accompanying drawings.

13. Apparatus for producing a pack of tissues substantially as hereinbefore described with reference to Fig. 4 of the accompanying drawings.

14. A pack of tissues produced by a method according to any one of claims 1 to 3, 10 and 11.

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1 479 299 COMPLETE SPECIFICATION
3 SHEETS

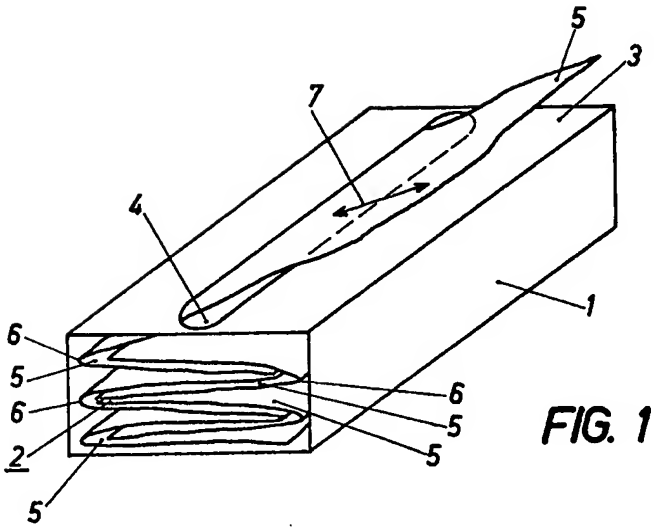

FIG. 1

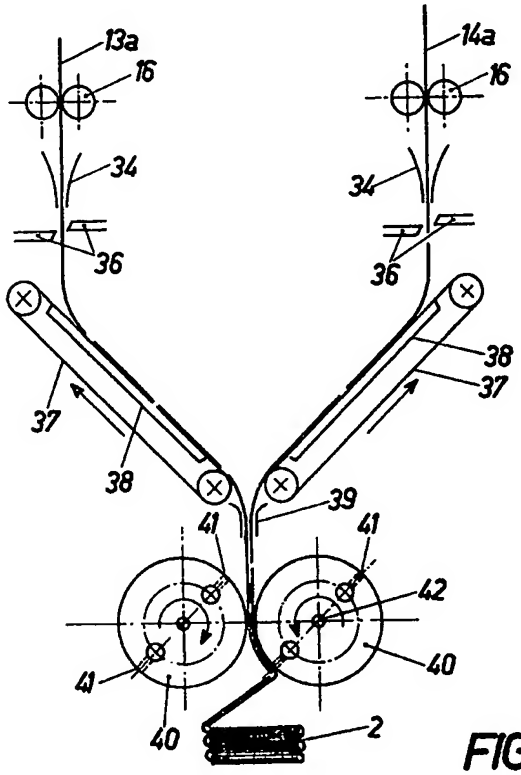

FIG. 4

1 479 299 COMPLETE SPECIFICATION
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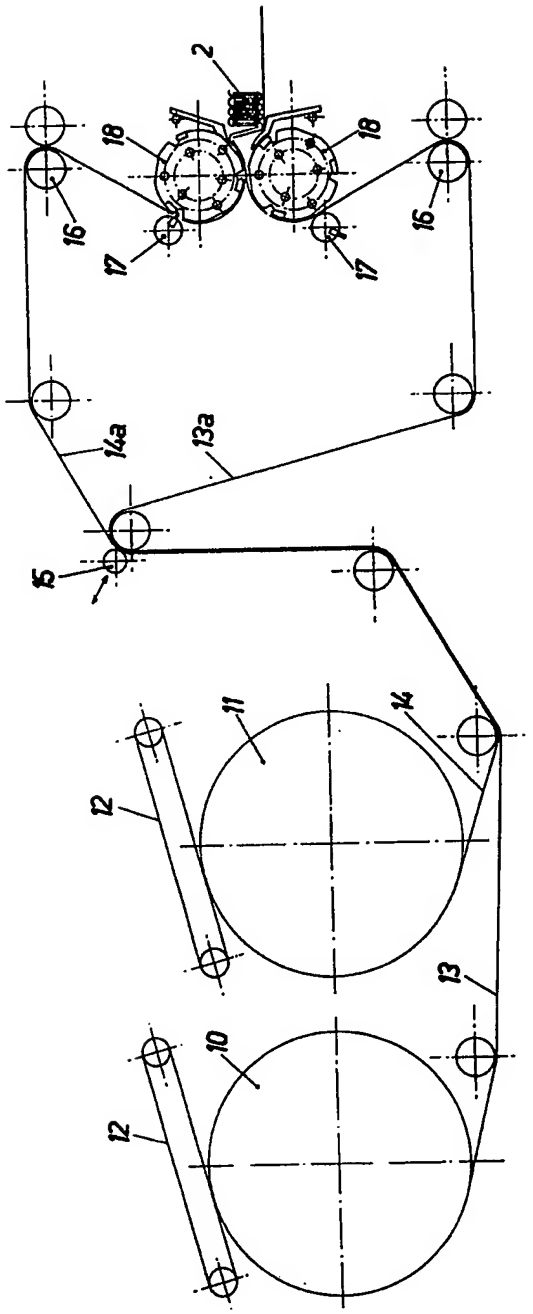

FIG. 2

1 479 299 COMPLETE SPECIFICATION
3 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEET 3

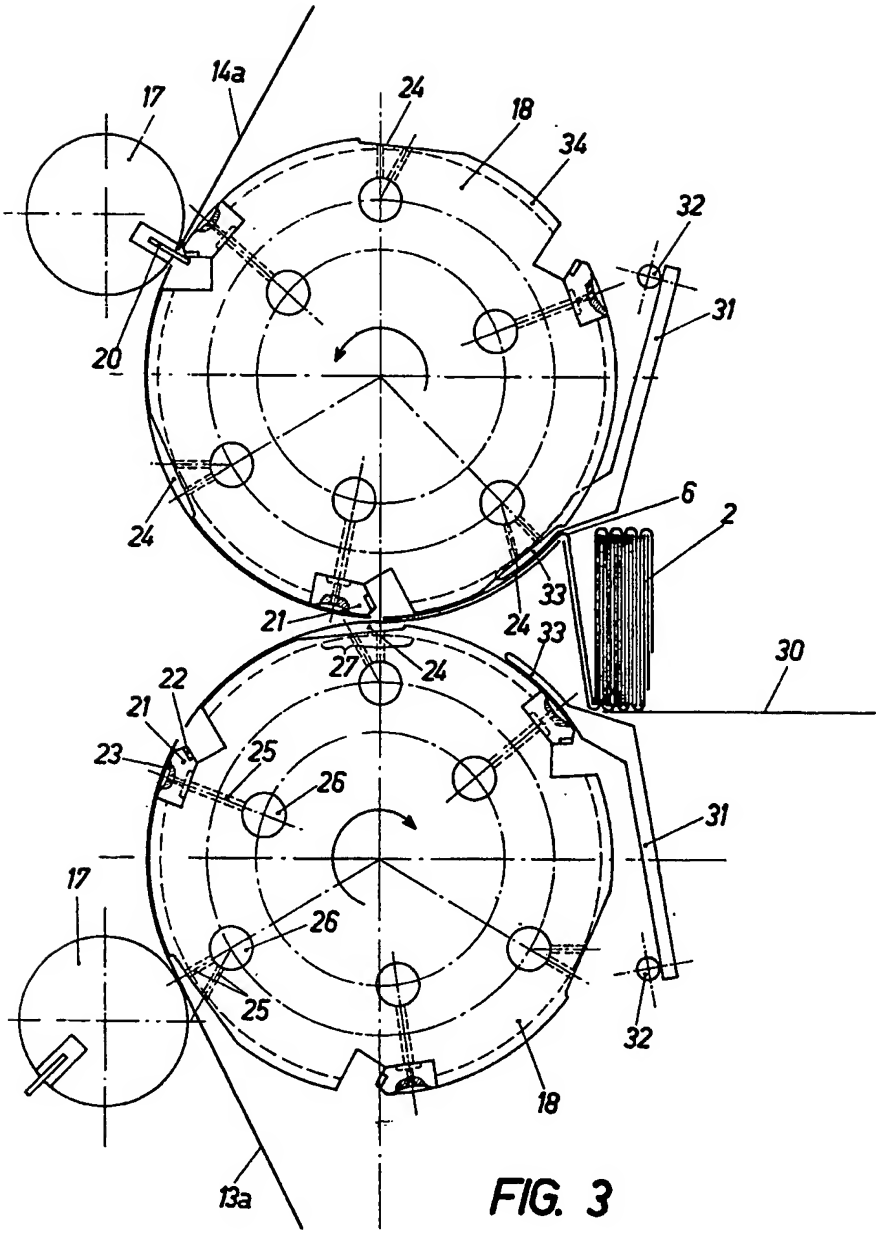

FIG. 3